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Abstract

Light robotics combines the latest developments in a variety of disciplines to achieve an all-optical toolbox for probing micro- and nano-environments in real-time 3D, opening up new avenues of applications of structure-mediated control of tiny biological constituents. Dynamic optical trapping is used for e.g. on-site assembly or disassembly of larger structures into component parts as well as their actuation to pre-determined sites with high precision. The optically manipulated and controlled structures of Light Robotics can be used to carry loads that can as well be functionalized to perform specific and predefined tasks. Structure-mediated transport provides convenience over direct particle trapping without compromising how precise particles can be moved and positioned. In cell trapping or transport, for example, damage due to direct irradiation can be substantially minimised by loading the cell into a prefabricated platform that is illuminated and moved around instead. Not only does this lessen the negative impact of high-intense radiation, but it also adds the benefit of having up to six degrees-of-freedom control over the robotic structure, hence on the specimen itself.

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